Consortium 2: Responses of benthic assemblages to interactive stress
WP 2.5: Interaction between intraspecific genetic diversity and environmental stress in early life-stage macroalgae

The role of genetic diversity levels on sensibility to global change in early life-stage macroalgae

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Background

Sensibility towards environmental stress is increased in the first life stage of the macroalgae *Fucus vesiculosus*. To predict populations resistance towards climate change stressors the key question remains to be answered whether or not climate change leads to selection of genotypes and whether a higher genetic diversity allows potential of evolutionary adaptation.

Experimental design

Experimental populations of *F. vesiculosus* germlings are exposed to single and combined climate stressors temperature and CO_2 in the **Kiel benthocosms**. Eight sibling groups are compared in their sensitivity to stress. The mean of this low diversity level is compared to a diverse pool of 16 sibling groupes.

Low diversity level

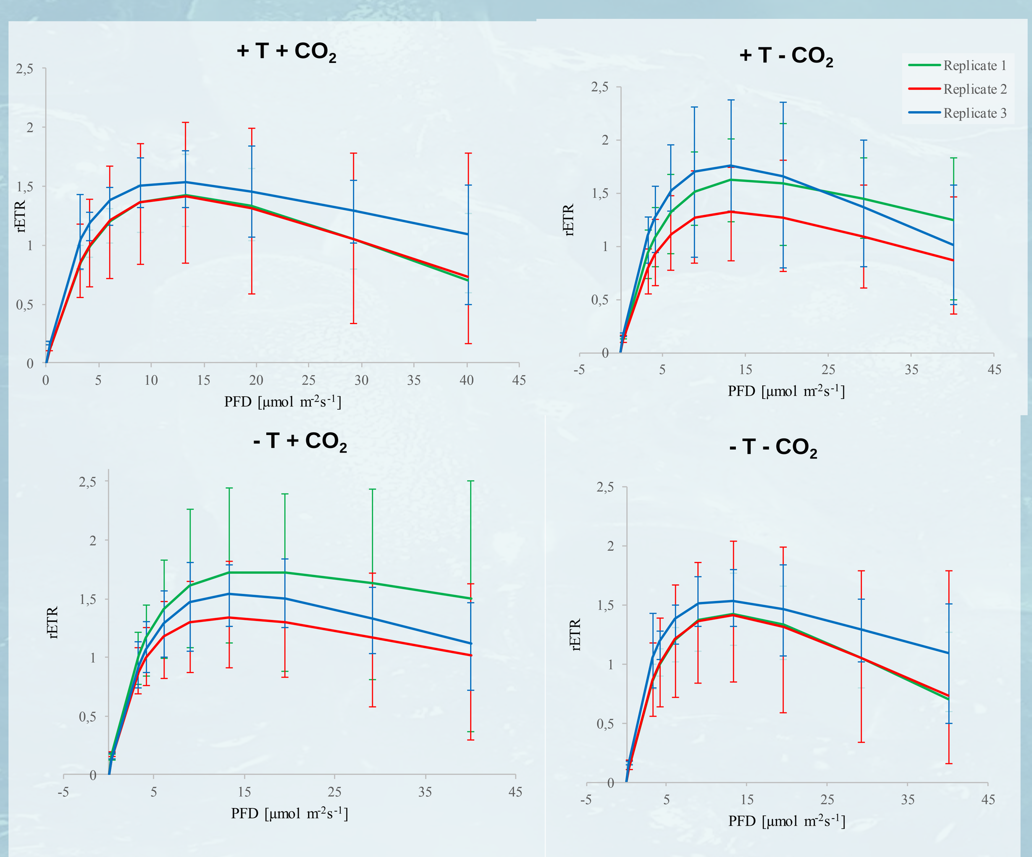
1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

vs

Pool 1 | Pool 2

High diversity level

Photosynthetic efficiency

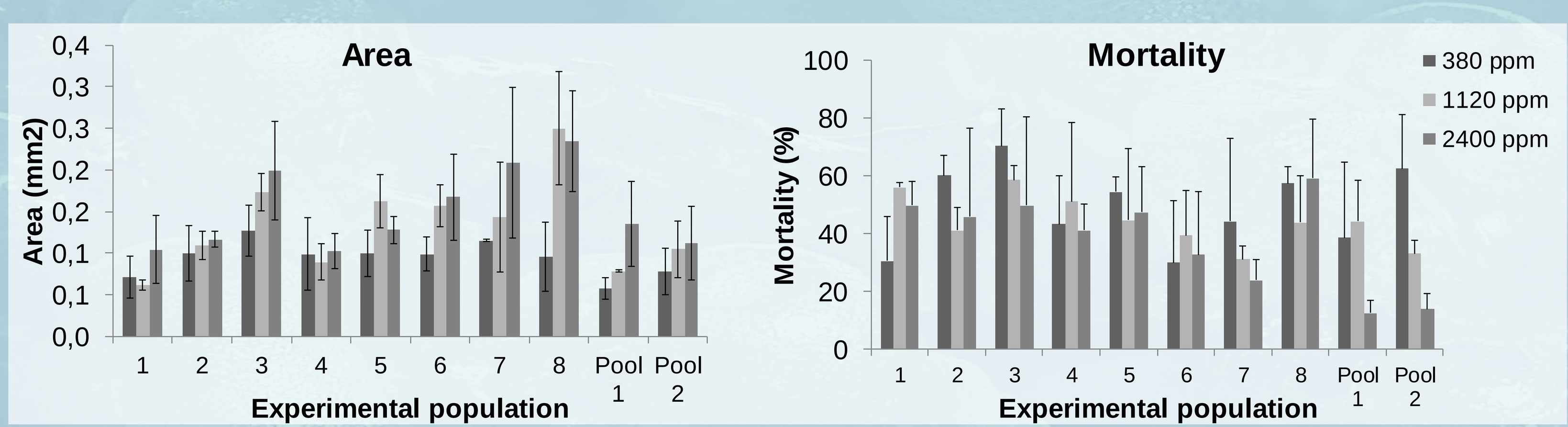


The relative electron tranport rate after four treatment combinations of the Kiel benthocosms.

At higher temperature germlings performed a higher photoinhibition, an indicator for stress resistance (p<0,05).

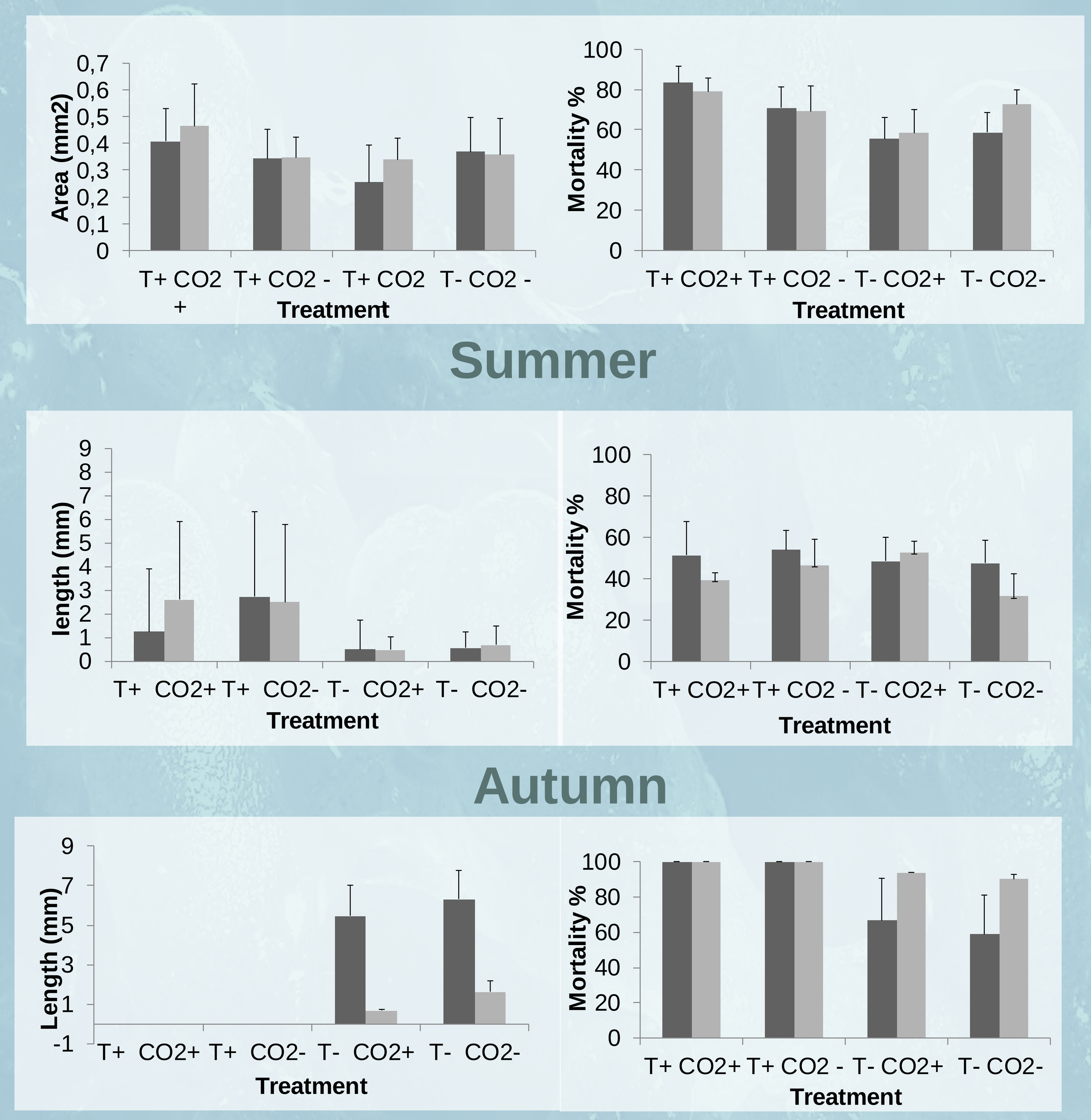
Mean and standard deviation

CO_2 as single stressor on diversity levels



The different impact of CO_2 stress among sibling groups on growth illustrates the potential for adaptation. Elevated CO_2 concentrations lead to an increase of growth. Mortality decreases significantly only in the diverse level, which indicates processes of selection (p<0,05).

Mean and standard deviation



Mean and standard deviation

Four combinations of climate change stressors show effects on growth and mortality, which differ between seasons and diversity levels.
Only in early summer the higher temperature increased growth, but lead to high mortality in late summer (p<0,05).

Conclusion

- The diverse impact of global change stressors on different genotypes demonstrate adaptational potential.
- Diverse populations might exhibit directed selection of those genotypes with advantageous phenotypic traits.
- Performance is not only mediated by abiotic factors, but also by biotic factors such as fouling at higher temperatures (data not shown).

Next steps

- For determing genetic diversity and detecting those genotypes selected in diverse populations, microsatellite markers are applied on germlings of *F. vesiculosus*.
- The correlation between the diversity of basibionts and microepiphytic and microbial biofilms will be analyzed (Cooperations with WPs 2.2 and 2.3).

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